Girard, Crawford county, Kansas: a tornado occurred at 8.40 a. m. of the 22d, destroying all the lighter buildings in its track, and injuring a number of persons. The path of the storm was only from fifty to seventy-five feet in width. Outside of Girard the damage was slight.

Mount Sterling, Montgomery county, Kentucky: a tornado, one hundred yards wide, passed through Bath county on the morning of the 26th, uprooting large trees, blowing down fences, and destroying light houses.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest depths for November, 1886, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, November, 1886.

[*Expressed in feet and tenths.*]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
Red River:						
Shreveport, Louisiana	29.9	30	10.4	14, 15	6.4	4.0
Arkansas River:						
Fort Smith, Arkansas	22.0	25	2.4	15, 16, 18 to [21, 30	1.1	1.3
Little Rock, Arkansas	23.0	25	8.0	3, 8	1.2	6.8
Missouri River:						
Yankton, Dakota	24.0	1, 2, 3	15.3	7	15.0	0.3
Omaha, Nebraska	18.0	1, 2, 3	6.2	26 to 29	4.9	1.3
Leavenworth, Kansas	20.0	20, 21	5.3	28	2.2	3.1
Mississippi River:						
Saint Paul, Minnesota	14.5	22	2.8	14	2.4	0.4
La Crosse, Wisconsin	24.0	1 to 5	4.6	26, 27	2.5	2.1
Dubuque, Iowa	16.0	1	5.2	30	1.9	3.3
Keokuk, Iowa	14.0	1	4.0	30	0.6	3.4
Saint Louis, Missouri	32.0	12	7.6	30	4.1	3.5
Cairo, Illinois	40.0	30	23.9	11, 12	3.8	20.1
Memphis, Tennessee	34.0	30	16.0	15, 16	3.4	12.6
Vicksburg, Mississippi	41.0	30	8.5	16, 19	0.0	8.5
New Orleans, Louisiana	13.0	17	2.8	27	1.0	1.8
Ohio River:						
Pittsburg, Pennsylvania	22.0	26	13.0	17	3.9	9.1
Cincinnati, Ohio	50.0	29	30.2	2	3.0	27.2
Louisville, Kentucky	25.0	25	11.6	1 to 4	2.6	9.0
Cumberland River:						
Nashville, Tennessee	40.0	27	22.6	1	0.5	22.1
Tennessee River:						
Chattanooga, Tennessee	33.0	28	13.7	5 to 8, 11 to [14	1.4	12.3
Monongahela River:						
Pittsburg, Pennsylvania	29.0	26	13.0	17	3.9	9.1
Savannah River:						
Augusta, Georgia	32.0	27	11.5	7	5.4	6.1
Mobile River:						
Mobile, Alabama		17	18.5	15	15.5	3.0
Sacramento River:						
Sacramento, California		2 to 11, 23 [to 30	8.0	1, 12 to 22	7.8	0.2
Willamette River:						
Portland, Oregon		1, 30	2.0	6	—1.1	3.1
Colorado River:						
Yuma, Arizona		3, 11, 25	15.4	1, 27 to 30	15.2	0.2

Light ice passed down the Mississippi River at La Crosse, Wisconsin, from the 19th to 23d, from the 24th to 28th the flowing ice had become heavy, and on the 29th the river was frozen over and navigation closed. The "Mountain Belle," the last boat of the season at La Crosse, arrived and departed on the 21st. The steamer "Saint Paul" left Saint Paul, Minnesota, for Saint Louis, Missouri, on the 10th; this was the last departure of the season and, owing to the heavy ice in the river, navigation was practically closed on that date.

On the Red River of the North at Saint Vincent, Minnesota, the cold weather preceding the 24th had thickened the ice to such an extent as to cause a suspension of navigation and the ferry boat plying between this point and Pembina, Dakota, was obliged to lay up, thus closing navigation here for the season of 1886. By the 30th the ice on the river had become strong enough to allow heavily-loaded teams to cross.

The Tennessee River below Chattanooga became navigable about the 20th, after having been closed since the middle of July, when all boating was practically stopped by low water.

The following notes relate to the state of river navigation during the month:

Cairo, Illinois: the rise in the Ohio River which commenced on the 17th enabled all river craft to resume navigation about the 24th. The Mississippi River between here and Saint Louis remains comparatively low.

Nashville, Tennessee: navigation was resumed on the Cumberland River on the 18th; the river had been unnavigable on account of low water since July 30th.

Louisville, Kentucky: navigation on the Ohio River was resumed at this point on the 19th, for several weeks prior to this date navigation had been discontinued by the larger class of boats.

Little Rock, Arkansas: on the 19th the Arkansas River began rising rapidly and several boats left port on that date; the river had been very low since October 11th.

Green Bay, Wisconsin: on the 24th Green Bay became frozen over and navigation at this port was closed for the winter.

Bismarck, Dakota: the Missouri River froze over at this point during the 16th and 17th and navigation was closed for the season.

Duluth, Wisconsin: navigation at this port closed for the season on the 30th; last departure for the lower lakes on the 28th; last arrival, the propeller "James Fisk, jr.," on the 30th.

FLOODS.

Buffalo, New York: during the heavy storm that prevailed during the 18th and 19th the wind blew steadily from the west, driving the water of the lake over the lower portion of city and damaging considerable property. Over two hundred feet of the track of the New York Central Railroad were undermined and washed away; the damage done was estimated at $10,000. The sea-wall was damaged, and all houses along a canal which runs through a part of the city were filled with water to a depth of two feet. Considerable farm property along the lake shore was submerged.

Poughkeepsie, Dutchess county, New York: on the morning of the 18th over two inches of rain fell in three hours; this is the largest rainfall that has occurred within such a short time for several years. Streams were suddenly swollen and sewers choked, while the lower part of the town was flooded. The storm was accompanied by high southeasterly winds, blowing down telegraph poles and signs and interrupting communication.

Memphis, Tennessee: on the 24th a freshet in Wolfe River, the result of heavy rains during the previous week, carried away lumber and damaged other property to an extent of $6,000.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Mount Washington, New Hampshire: an auroral light was noticed in the north at 7.50 p. m. of the 2d; when first seen it was in the form of a white light with a slight, lateral, wavy motion from west to east. The aurora at its centre rested directly on the northern horizon and extended about 30° east and west of the north; altitude 50°. At 9.20 p. m. a few streamers were observed rising from the centre of the aurora and terminating near the zenith; streamers were seen at intervals of from three seconds to five minutes until 10.40 p. m. The display reached its maximum brilliancy between 9.20 and 10.40 p. m. and disappeared after midnight.

Fort Assinaboine, Montana: an auroral arch was visible from 11.33 to 11.57 p. m. of the 2d; it was of a pale straw color; altitude, 7°; azimuth, 50°; no streamers appeared. The display was obscured by clouds at 11.57 p. m. On the 3d a brilliant aurora was visible from 10.35 to 11.20 p. m. The observer states that in shape and color it resembled that seen on the previous night, and appeared to be a continuation of the same aurora, although the display of the 3d was accompanied by streamers of a bluish white tint extending almost to the zenith and having a motion resembling the blaze of a large fire when disturbed by the wind.

Duluth, Minnesota: on the 3d, at 10.15 p. m., a faint aurora in the form of a broad belt of light was visible in the northern horizon; azimuth, 160° to 240°; altitude, 10°; the display ended at 11.55 p. m.

Port Huron, Michigan: on the 4th, at 10.30 p. m., a brilliant aurora was observed with numerous beams flashing up toward the zenith; at 12.15 a. m. the aurora had assumed the shape of two arches, the lower one extending from azimuth 95° to 260°. The display was brightest at 1.10 a. m. of the 5th, after which it gradually faded, but was still visible at 1.45 a. m.

Buffalo, New York: an aurora was visible from 9.20 to 11.15 p. m. of the 23d; it consisted of a diffused white light resting on a broad arch of slate-colored sky. It varied but little in brilliancy and began to fade at 10.30 p. m.

Fort Totten, Dakota: on the 23d an aurora was visible from 9.40 p. m. until midnight; it consisted of a double arch, with beams of light shooting upward from the lower one until 11 p. m.

Auroral displays were also observed during the month, as follows:

2d.—Voluntown, Connecticut; Webster, Dakota; Eastport, Kent's Hill, and Orono, Maine; Amherst, Westborough, and Cambridge, Massachusetts; Nashua, New Hampshire; North Volney, New York; Embarras, Wisconsin.

3d.—Webster, Dakota; Monticello, Iowa; Escanaba, Michigan; Moorhead, Minnesota; Poplar River, Montana; Green Bay, Wisconsin.

4th.—Monticello, Iowa; Vineyard Haven and Amherst, Massachusetts; Escanaba, Michigan; Poplar River, Montana; Nashua, New Hampshire.

5th.—Mackinaw City, Michigan; Poplar River, Montana.

6th.—Fort Buford, Dakota; Pekin, Illinois.

7th.—Ithaca, New York.

14th.—Pekin, Illinois.

15th.—Mackinaw City, Michigan.

18th.—Amherst, Massachusetts.

20th.—Portland, Maine; Milton and North Truro, Massachusetts.

21st.—Yaukton, Dakota.

22d.—Cresco, Iowa; Poplar River, Montana.

23d.—Webster, Dakota; Cedar Rapids, Iowa; Escanaba, Michigan; Poplar River, Montana; Prairie du Chien, Wisconsin.

24th.—Escanaba, Michigan.

25th.—Kent's Hill, Maine; Mackinaw City, Michigan.

27th.—Pekin, Illinois.

29th.—Escanaba and Mackinaw City, Michigan; North Truro, Massachusetts; Nashua, New Hampshire.

30th.—Fort Buford, Dakota; Escanaba and Mackinaw City, Michigan; Moorhead, Minnesota.

ELECTROMETER READINGS.

[Prepared under the direction of Prof. T. C. MENDENHALL, Assistant.]

Observations have been made during the month of November, 1886, daily, at 9 a. m., 11 a. m., 1 p. m., and 3 p. m., at five stations, and continuously by means of photography at one station.

At Washington City the observations, compared with those of the preceding month, show a higher general average. At four different times were negative indications obtained. The dates and accompanying conditions of these indications were as follows:

November 6th, in the afternoon, highest value about 100 volts, during light rain; November 12th, from 11.20 a. m. until 12.25 p. m., and from 1.51 p. m., with intervals of positive, until late in the afternoon. The highest negative value, nearly 600 volts, when the weather was rainy. On November 25th, in the afternoon, the highest value, about 450 volts, during heavy rain. On November 30th, in the afternoon, during light rain.

Every instance of negative electricity, as far as the observations go, occurred during rain.

On November 3d and 12th observations were made simultaneously at the top of the Washington Monument and at the Instrument Room of the Signal Office. The observations when plotted give the curves shown in the two diagrams of chart number vi. These experiments are of particular interest for several reasons. They may be taken as fairly illustrative of the difference in the value of the potential at two different heights, and the effect of the weather in modifying these values. The two days were, as regards weather, exactly opposite. November 3d was a bright, fair day, a trifle hazy, with very light wind and a haze or smoke on the northern and northwestern horizon. The sky was about 0.7 covered with cirro-stratus clouds with hardly any motion. November 12th began with a cloudy, threatening morning, with fresh northeasterly winds, and a prediction, based upon the indications of the electrometer, of coming rain. Rain did not fall at the Monument until 11.30 a. m., although the electrometer gave a zero value at 11.12, and from that time on a steadily increasing negative value, until just preceding the rain, when the indications, although all negative, were very variable. Rain is recorded at the Signal Office as beginning at 11.20 a. m., the electrometer there indicating a positive value at 11.15 and a negative value at 11.20 a. m. At the Monument thick sparks could be obtained, at least as many as thirty per minute. During the afternoon masses of fog would drift by, sometimes below and sometimes enveloping the top of the Monument.

The following abridged record of the observations at the two places shows many interesting features:

Time.	November 3.			November 12.		
	Monument.	Signal Office.	Difference.	Monument.	Signal Office.	Difference.
	Volts.	*Volts.*	*Volts.*	*Volts.*	*Volts.*	*Volts.*
10.45 a. m.	1250			500	90	410
11 a. m.	1225	282	943	575	132	443
11.05 a. m.	1175	306	869	450	84	366
11.10 a. m.	1200	288	912	125	114	11
11.15 a. m.	1350	258	1092	— 50	24	74
11.20 a. m.	1325	258 / 270	1067 / 1055	— 200	— 6	196
11.25 a. m.	1400	324	1076	— 600	—102	498
11.30 a. m.	1400	324	1076	— 575	— 90	485
11.35 a. m.	1100	354	746	—1300	—288	1012
11.40 a. m.	1125	252	873	—1650	—594	1056
11.45 a. m.	1200	264	936	— 500 / —1000	—468	
11.50 a. m.	1200	258	942	— 250 / —1250	—480	
11.55 a. m.	1150	258	892	—1500	—480	1120
12 m.	1200	258	942	— 250 / —1500 / — 250	—378	
12.05 p. m.	1325	240	1085	—1500	—246	1254
12.10 p. m.	1300	246	1054	— 750	—276	474
12.15 p. m.	1225	240	985	— 700	—186	514
12.20 p. m.	1325	222 / 234	1091	— 275	— 42	233
12.25 p. m.	1325	294	1031	100	— 42	58
12.30 p. m.	1225	300	925	600	30	570
12.35 p. m.	1225	300	925	625	60	565
12.40 p. m.	1125	300	825	250	30	220
12.45 p. m.	1200	270	930	225	24	201
12.50 p. m.	1150	282	868	75	18	57
12.55 p. m.	1075	240	835	350	36	314
1 p. m.	1200	246	954	125	6	119
1.01 p. m.	1175	246	829	125	6	119
1.02 p. m.	1150	234	916	75	0	75
1.03 p. m.	1138	240	898	100	0	100
1.04 p. m.	1125	246	879	125 / 250	6	246
1.05 p. m.	1150	240	910	300 / 425	18	407
1.06 p. m.	1138	246 / 258	880	450 / 500	24	476
1.07 p. m.	1125	192	933	450	24	426
1.08 p. m.	1125	228	897	300	24	376
1.09 p. m.	1162	294	868	250	18	232
1.10 p. m.	1162	270	892	200	12	188
1.11 p. m.	1150	286	864	250	12	238
1.12 p. m.	1138	276	862	300	18	282
1.13 p. m.	1175	270	905	400	24	376
1.14 p. m.	1175	273	902	500	30	470
1.15 p. m.	1150	282	868	600	30	570
1.16 p. m.	1125	279	846	500	30	470
1.17 p. m.	1075	294	781	450	18	432
1.18 p. m.	950	270	680	400	24	376
1.19 p. m.	925	270	655	375	24	351
1.20 p. m.	912	258	654	375	18	357
1.21 p. m.	925	252	673	375	18	357
1.22 p. m.	950	246 / 264	686	375	24	351
1.23 p. m.	1000	240	760	400	30	370
1.24 p. m.	1025	228	797	450	36	414
1.25 p. m.	1050	216	834	525	36	489
1.26 p. m.	1025	222	803	825	42	783
1.27 p. m.	1012	228	784	1050	48	1002
1.28 p. m.	975	246	629	1100	66	1034
1.29 p. m.	925	234	691	1550	78	1472